IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. Patent Application of	)	
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YAMAZAKI et al.	)	**Unit 1794**
	)	
Application Number: 10/576,677	)	**Examiner**
	)	**Ahmed, Sheeba**
Filed: April 21, 2006	)	
	)	
For: MULTILAYER FILM	)	
	)	
Attorney Docket No. NISH.0003	)	

Commissioner of Patents
P.O. Box 1450
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DECLARATION OF ONE SKILLED IN THE ART
UNDER 37 C.F.R.§1.132

Sir:

I, Hideaki TANAKA am the inventor of the above identified application, and hereby declare as follows:

I have reviewed the above-referenced patent application and carefully considered the Examiner's rejections based upon Ohba et al. (US 6,605,344). It is my conclusion that the invention recognized the following problems and developed the following solutions as described below, which were not taught or suggested by Ohba. The specified concentration gradient structure as recited in (i) or (ii) of claim 1 and the peak ratio recited in claim 1, and the relevant "unexpected results" recited in the dependent claims are achieved only by the present invention, but not Obha.

In particular, Ohba's gas barrier film is obtained by heating a polymer layer formed of a mixture of a poly(meth)acrylic polymer and a polyalcohol at a high temperature. For example, the polymer layer was heat-treated for at 180°C for 15 minutes or at 230°C for 30 seconds. As such, an ester bond is formed between the poly(meth)acrylic polymer and the polyalcohol in the polymer layer. Since Ohba's gas barrier film has a highly crosslinked structure by the ester bond, such a film is difficult to scrap or regenerate as those according to the prior art described in [0005]-[0010] of the publication of the specification.

In addition, Ohba merely determines the existence ratio of "the number of counting of metallic atoms"/"the number of counting of oxygen atoms" by energy-dispersive X-ray

spectroscopy (EXD) to confirm that a metal is invaded from a metal compound-containing layer. However, Ohba neither discloses nor suggests the specified concentration gradient structure as recited in (i) or (ii) of claim 1.

I and the co-inventors found that a film excellent in gas barrier properties, moisture resistance, water resistance, hot water resistance and water vapor resistance, can be obtained by ionically crosslinking a carboxyl group-containing polymer, such as poly(meth)acrylic acid with a polyvalent metal. The multi-layer film according to the present invention has the carboxyl group-containing polymer layer ionically crosslinked by a polyvalent metal ion which does not need to be subjected to heat treatment at a high temperature because no ester bond exists. This film is neither dissolved in nor deformed by water, hot water, water vapor and the like under ordinary service conditions. However, when dissolved in strongly acidic or alkaline water, the film can be easily scrapped or regenerated. However, when this film or a multi-layer film comprising this film is subjected to folding processing or flex fatigue, its oxygen gas barrier property is deteriorated like those prior art films ([0011]-[0012]). Another object of the present invention is to solve the flex fatigue problem ([0024]).

The solution according to the present invention is to obtain the film by ionically crosslinking the carboxyl group-containing polymer with the polyvalent metal and to provide a gradient structure in a thickness-wise direction in the concentration of a polyvalent metal salt as recited in (i) or (ii) of claim 1 which is formed by the reaction of the carboxyl group-containing polymer with a polyvalent metal compound. In the multi-layer film according to the present invention, the flexibility of the multi-layer film is improved because the low concentration region of the polyvalent metal salt of the carboxyl group-containing polymer is present in the carboxyl group-containing polymer layer, such that it has excellent forming and processing abilities.

When a multi-layer film comprising this multi-layer film of the present invention and other resin layers is repeatedly folded to form a product (for example, a bag or container), its oxygen gas barrier property is temporally deteriorated. The multi-layer film nevertheless recovers to the original oxygen gas barrier property with time. Even when gas barrier properties are temporally deteriorated by flex fatigue, the gas barrier properties are recovered later. This is due to the low concentration region of the polyvalent metal salt of the carboxyl group-containing polymer in the polymer layer, and a new ionic bond (polyvalent metal salt) formed by migrating the polyvalent metal compound into the low concentration region.

Even when such a concentration gradient is provided, excellent gas barrier properties are exhibited so far as the degree of ionic crosslinking in the whole polymer layer is controlled to a prescribed value or higher. i.e., the peak ratio A_{1560}/A_{1700} recited in claim 1.

Ohba simply did not recognize such problems and the solutions as described above. Consequently, Ohba neither teaches nor suggests such a multi-layer film with a concentration gradient structure of the polyvalent metal salt of the carboxylic group-containing polymer as recited in claim 1.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statement were made with the knowledge that willful false statements and the like so made are punishable by fine, or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-captioned application and any patent to issue thereon.

Respectfully submitted this 18th day of September, 2008

Hideaki TANAKA

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